IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of **Stolze**	)	
	)	PATENT PENDING
Serial No.: **10/789,485**	)	
	)	Examiner: Mr. Andrew Owens Arena
Filed: **February 27, 2004**	)	
	)	Group Art Unit: 2811
For: **Power Semiconductor Module**	)	
	)	Confirmation No.: 7994
Docket No: **5497-015**	)	

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APPEAL BRIEF

(I.) REAL PARTY IN INTEREST

The real party in interest is Infineon Technologies AG.

(II.) RELATED APPEALS AND INTERFERENCES

None.

(III.) STATUS OF CLAIMS

Claims 1, 3-5, 8, 9, 11, 13-14 and 17-24 are pending in this case. Claims 1, 3-5, 8, 9, 11, 13-14 and 17-24 stand rejected and are being appealed herein. Claims 2, 6-7, 10, 12, and 15-16 were previously canceled.

(IV.) STATUS OF AMENDMENTS

All amendments have been entered in this case.

(V.) SUMMARY OF CLAIMED SUBJECT MATTER

There are four independent claims on appeal, claims 1, 14, 23 and 24.

Claim 1 is directed to a power semiconductor module (Figures 1 and 3; Published Spec. ¶¶ [0010]-[011], [0032]-[34], [0038]) comprising: a plurality of semiconductor components situated on substrate regions (Figures 1-4; Published Spec. ¶¶ [0012], [0015], [0032], [0038]), wherein each substrate region has a top surface and side faces, wherein side faces of two adjacent substrate regions face each other (Figures 1-4); between each two adjacent substrate regions an elastic connecting element is arranged such that the connecting element directly contacts the side faces of the two adjacent substrates (Figures 1-4; Published Spec. ¶¶ [0017],

[0035], [0039]), wherein said connecting elements are designed to prevent a deformation of one substrate region to continue to an adjacent substrate region (Published Spec. ¶¶ [0011]-[14], [0017]-[18], [0035]); wherein the connecting elements are formed by recesses in a plastic injection-molded module housing enclosing said substrate regions (Figures 1 and 3; Published Spec. ¶¶ [0019], [0022], [0033], [0035] and [0038]-[39]), each recess extending from an exterior of the housing and being arranged between adjacent substrate regions (Figures 1 and 3); and wherein a thickness of the power semiconductor module is reduced between adjacent substrate regions due to the recesses (Figures 1 and 3).

Claim 14 is directed to a power semiconductor module (Figures 1 and 3; Published Spec. ¶¶ [0010]-[011], [0032]-[34], [0038]) comprising: a plurality of substrate elements having top and bottom surface and side walls, each substrate element comprising a semiconductor component arranged on the top surface of a substrate element (Figures 1-4; Published Spec. ¶¶ [0012], [0015], [0032], [0038]); one or a plurality of elastic connecting elements directly contacting opposing side walls of two adjacent substrate elements, wherein said connecting elements are designed to prevent a deformation of one substrate element to continue to an adjacent substrate element (Figures 1-4; Published Spec. ¶¶ [0011]-[14], [0017], [0035], [0039]); a plastic injection-molded module housing enclosing said plurality of substrate elements (Figures 1 and 3; Published Spec. ¶¶ [0019], [0022], [0033], [0035] and [0038]-[39]); wherein the connecting elements are formed by recesses in the module housing extending from an exterior of the housing and are arranged between adjacent substrate elements (Figures 1 and 3); and wherein a thickness of the power semiconductor module is reduced between adjacent substrate elements due to the recesses (Figures 1 and 3).

Claim 23 is directed to a power semiconductor module (Figures 1 and 3; Published Spec. ¶¶ [0010]-[011], [0032]-[34], [0038]) comprising: a heat sink having a flat surface (Figures 1 and 3; Published Spec. ¶¶ [0018], [0025], [0033], [0037]-[39]), a plurality of substrates

arranged on the flat surface of the heat sink (Figures 1 and 3; Published Spec. ¶¶ [0025], [0033], [0037]-[39]); a plurality of semiconductor components arranged on the substrates (Figures 1-4; Published Spec. ¶¶ [0012], [0015], [0032], [0038]), one or a plurality of elastic connecting regions in direct contact with adjacent ones of the substrates and arranged directly on the flat surface of the heat sink between adjacent ones of the substrates (Figure 1), wherein the connecting regions are designed to prevent a deformation of one substrate to continue to an adjacent substrate and the connecting regions are formed by recesses in a plastic injection-molded module housing enclosing said substrates (Figures 1-4; Published Spec. ¶¶ [0011]-[14], [0017], [0019], [0022], [0033], [0035] and [0038]-[39]), each recess extending from an exterior of the housing and being arranged between adjacent substrates (Figures 1 and 3), wherein a thickness of the power semiconductor module is reduced between adjacent substrates due to the recesses (Figures 1 and 3).

Claim 24 is directed to a power semiconductor module (Figures 1 and 3; Published Spec. ¶¶ [0010]-[011], [0032]-[34], [0038]), comprising: a substrate segmented into a plurality of spaced apart substrate regions (Figures 1-4; Published Spec. ¶¶ [0012], [0015], [0032], [0038]); at least one semiconductor component arranged on one or more of the substrate regions (Figures 1-4; Published Spec. ¶¶ [0012], [0015], [0032], [0038]); a plastic injection-molded module housing enclosing said substrate regions and said at least one semiconductor component (Figures 1 and 3; Published Spec. ¶¶ [0019], [0022], [0033], [0035] and [0038]-[39]); connecting regions formed by recesses in the module housing, each recess extending from an exterior of the housing and being arranged between adjacent substrate regions (Figures 1-4; Published Spec. ¶¶ [0011]-[14], [0017], [0035], [0039]); wherein the connecting region functions as an articulated hinge with each of the adjacent substrate regions so that the adjacent substrate regions can move relative to one another about the articulated hinges (Published

Spec. ¶¶ [0017], [0035]); and wherein a thickness of the power semiconductor module is reduced between adjacent substrate regions due to the recesses (Figures 1 and 3).

(VI.) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1, 3, 8-9, 12-14 and 19-24 are anticipated under 35 U.S.C. 102(b) by U.S. Patent No. 6,157,538 (hereinafter the Ali reference).

Whether claims 4-5, 11 and 18 are obvious under 35 U.S.C. 103(a) over the Ali reference in view Japanese Patent Publication No. 2001-118987 (hereinafter the Mikio reference).

(VII.) ARGUMENT

A. The Finding With Regard To The Claimed Housing Is In Error

Each pending independent claim recites *inter alia* a plastic injection-molded module housing. It is argued at lines 9-10 on p. 2 of the 29 April 2010 Advisory Action that the entire assembly shown in Figure 4 of the Ali reference is akin to the claimed housing, including socket 20 and the void/open region shown in the middle part of the socket 20. This finding directly contradicts the express teachings of the Ali reference, and therefore is in factual error.

The Ali reference explicitly defines element 11 shown in Figure 4 as the housing of a system 10 such as a computer (*c.f.* col. 2, lines 8-16 of Ali). The Ali reference further teaches that support structure 12 such as a main circuit board or some other support structure includes the socket 20, and the socket 20 has ports for coupling to electronic devices 14 and 16 (*c.f.* col. 2, lines 8-11 of Ali). The support structure 12 with socket 20 and the electronic devices 14 and 16 are "contained within the housing 11" of the system 10 according to the express teachings of the Ali reference (*c.f.* col. 2, lines 11-13 of Ali). Therefore, the entire assembly shown in Figure 4 of the Ali reference is not a plastic injection-molded housing as argued in the 29 April 2010

Advisory Action. Instead, element 11 in Figure 4 of the Ali reference is the housing according to the express teachings of the reference. To find otherwise ignores the teachings of the Ali reference. The claim rejections are therefore based on factual error and must be withdrawn.

B. The Claim Term 'Recesses' is Misconstrued

Each pending independent claim recites *inter alia* that the connecting elements are formed by recesses in the module housing. The claim term "recesses" is misconstrued, and therefore all claim rejections are in error and must be withdrawn.

The law of claim construction in *ex parte* prosecution requires the Examiner to give a claim term its plain and ordinary meaning, unless it is inconsistent with the specification. MPEP § 2111. Moreover, the claims themselves provide substantial guidance as to the meaning of particular claim terms. The context of the surrounding words of the claim is considered in determining the ordinary and customary meaning of the claim terms. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005). And, of course, the construction given a claim term must be consistent with the specification and how a person of ordinary skill in the art would construe the term in light of the specification. See *In re Wheeler*, 2008-1215, Serial No. 10/899,352 (Fed. Cir. 2008), *In re Hyatt*, 211 F.3d 1367, 54 USPQ2d 1664 (Fed. Cir. 2000), *In re Cortright*, 165 F.3d 1353, 49 USPQ2d 1464 (Fed. Cir. 1999), MPEP § 2111.01.

"Recesses", properly construed, means "receding parts or spaces." This is the plain and ordinary meaning of the term. See Exhibit A, definition of "recess" from http://dictionary.reference.com/browse/recess, said definition having been proffered by Applicants in the reply filed 19 April 2010. This construction is also consistent with the specification and how a person of ordinary skill in the art would construe the term.

The Examiner finds that the sockets 20 disclosed in the Ali reference are akin to the claimed connecting elements and that the "entire assembly" shown in Figure 4 of Ali is akin to

the claimed housing (*c.f.* line 8 on p. 2 of the 29 April 2010 Advisory Action). The entire assembly shown in Figure 4 of Ali is not akin to the claimed housing as explained *supra* in section VII(A). Instead, the Ali reference explicitly defines element 11 in Figure 4 as the housing (*c.f.* col. 2, lines 8-16 of Ali).

The pending independent claims recite that the connecting elements are formed by recesses in the module housing. The alleged connecting elements in the Ali reference are sockets 20 for coupling to electronic devices 14 and 16. The respective sockets 20 are attached or otherwise mounted to the interior surface of circuit board 12 and thus are not recesses in a plastic injection-molded module housing as claimed. No reasonable construction of the claim term "recesses" can include the sockets 20 disclosed in the Ali reference. All claim rejections are in error and must be withdrawn because the Patent Office either has misconstrued the claim term "recesses."

C. The Claim Term 'Exterior' Is Misconstrued

Each pending independent claim recites *inter alia* that the connecting elements extend from an exterior of the housing. The claim term "exterior" is misconstrued, and therefore all claim rejections are in error and must be withdrawn.

The claim term "exterior" is used in the pending claims as a noun and not and adjective, and should be construed to mean "the outer surface or part; outside." This is the plain and ordinary meaning of the term. See Exhibit B, definition of "exterior" from http://dictionary.reference.com/browse/recess, said definition having been proffered by Applicants in the reply filed 19 April 2010. The Examiner does not dispute this construction (*c.f.* line 12 on p. 2 of the 29 April 2010 Advisory Action). However, it is argued at lines 19-20 on p. 2 of the 29 April 2010 Advisory Action "for extended bodies with many pieces contained in the

interior, the idea of extending from an exterior is properly and reasonably interpreted to include items on the interior." Applicants respectfully disagree.

The recess extending from the exterior of the housing as claimed cannot include "items on the interior" as argued by the Examiner in the 29 April 2010 Advisory Action. Such a construction strips the noun "exterior" of any appreciable meaning. Items on the interior of a housing do not include the outer surface or outside of the housing. Also, the Examiner gives an example of a residential home with a dividing wall extending into a room from an exterior wall in further support of the Patent Office's position. However, this example uses "exterior" as an adjective to describe the wall *i.e.* "exterior wall", not a noun as used in the pending claims *i.e.* "an exterior of the housing."

Socket 20 of Ali's system 10 does not extend from the exterior of housing 11 as claimed. Instead, the socket 20 abuts the interior surface of circuit board 12 and extends downward to lower plate 66 as shown in Figures 2 and 4 of the Ali reference. No reasonable construction of the claim term "exterior" can include the interior surface of circuit board 12 to which the sockets 20 are attached. To find otherwise would directly contradict the plain and ordinary meaning of the noun "exterior."

Also, the Examiner misinterprets Figure 3 of the instant application in the second last paragraph on p. 2 of the 29 April 2010 Advisory Action. In referring to Figure 3 of the instant application, the Examiner states that recess 130 extends from top side 140 of housing 120 without the recess itself being outside (*c.f.* the second last sentence on p. 2 of the 29 April 2010 Advisory Action). Figure 3 of the instant application shows a second embodiment of the claimed invention where recesses 130 and 131 formed in housing 120 extend from the exterior module underside 125. Thus, the embodiment shown in Figure 3 of the instant application is consistent with and fully supports Applicants' position that the claimed recesses formed in the housing extend from an exterior *i.e.* outer surface or outside of the housing. Applicants note that Figure

1 of the instant application shows a first embodiment of the claimed invention where recesses 35 and 36 formed in housing 20 extend from the exterior module topside. In both embodiments, the recesses formed in the housing extend from an exterior *i.e.* outer surface or outside of the housing as claimed.

Accordingly, all claim rejections are in clear error and must be withdrawn because the alleged connecting elements in the Ali reference (*i.e.* sockets 20) extend from the interior of the circuit board 12, not the exterior of housing 11 as claimed.

D. The Ali Reference Does Not Teach Or Suggest Recesses In A Module Housing As Claimed

The claim terms "recesses" and "exterior" impart particular structural features to the claimed invention as explained supra in sections VII(B) and VII(C), respectively, and cannot be ignored by the Patent Office. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) and MPEP § 2113. The claimed invention is structurally differentiated over Ali's system 10 by claiming the connecting elements as recesses in the module housing. Reciting that the recesses extend from the exterior of the housing further structurally differentiates the claimed invention over Ali's system 10. Ali does not teach or suggest at least these claim features as explained *supra* in sections VII(B) and VII(C). Notably, neither the socket 20 nor the void/open region in the middle of the socket 20 is formed by a recess in Ali's housing 11 as claimed. Applicant therefore respectfully submits that all claim rejections are in further error and must be withdrawn for this yet additional reason.

E. The Ali Reference Does Not Teach Or Suggest An Articulated Hinge As Claimed

The Examiner finds that the claimed articulated hinge element recited in independent claim 24 does not structurally distinguish the claimed apparatus from the Ali reference. In

support, the Examiner argues there is nothing in the instant application defining the term "articulated hinge" to exclude the structure disclosed in the Ali reference (*c.f.* lines 10-12 on p. 2 of the 2 April 2009 Final Office Action). Applicants respectfully disagree.

Paragraph [0035] of the instant published application explicitly defines what is meant by the term "articulated hinge." Paragraph [0035] is reproduced immediately below with emphasis added to highlight the portions particularly pertinent to the meaning of the term "articulated hinge":

> Besides the substrate regions 3, 4, and 5 the substrate 2 has connecting regions 30 and 31 formed between the substrate regions (also cf. FIG. 2). The substrate regions 3 and 4 are connected such that they can move relative to one another e.g. via the connecting region 30. **The connecting region 30 functions as it were as an articulated joint or hinge, so that the substrate regions 3 and 4 can also be oriented with respect to one another to form an angle other than 180° (correction angle)**. By way of example, this prevents a deformation of the substrate region 3 from continuing into the substrate region 4. By way of example, if the substrate region 3 is tilted through an angle α (illustrated in greatly enlarged and exaggerated fashion in FIG. 1) with respect to the horizontal H due to deformations on account of thermally induced stresses, **it is possible, by correspondingly tilting the substrate region 4 in the opposite sense, to avoid a propagation of said angle α into the substrate region 4** and even to compensate for the tilting by means of an equal and opposite tilting. A module underside 25 which is free to the greatest possible extent from deformations manifested on account of thermally induced stresses is thus provided as contact area of the power semiconductor module.

The connecting element thus enables adjacent substrate regions to be oriented with respect to one another to form an angle other than 180°. This way, if one of the substrate regions is tilted through angle α with respect to the horizontal, the connecting element acts as an articulated hinge and tilts the adjacent substrate region in the opposite direction to avoid a propagation of the angle α into the substrate region. By acting as an articulated hinge, the connecting element can compensate for the tilting by means of an equal and opposite tilting.

The Examiner argues that Ali's socket 20 functions as the articulated hinge element of claim 24 (*c.f.* lines 1-2 on p. 7 of the 22 February 2010 Final Office Action). Applicants respectfully disagree.

Two modules 14, 16 plug into Ali's socket 20. Each Figure in the Ali reference shows the modules 14, 16 always being at the same angle with respect to one another when plugged into the socket 20. Mainly, the modules 14, 16 are always oriented at 180° angle with respect to one another when inserted in the socket 20. This is not what is meant by the term "articulated hinge" as defined in the instant application as explained above. Moreover, a socket having ports for coupling to electronic devices such as Ali's socket 20 is not akin to an articulated hinge within the plain and ordinary meaning of the term. Particularly, nothing in the Ali reference teaches or suggests that if one of the modules 14, 16 is tilted through an angle α with respect to the horizontal, the socket 20 can tilt the other module in the opposite direction to avoid a propagation of the angle α into the module. Thus, Ali's socket 20 is not an articulated hinge as claimed. For this further reason, the rejection of claim 24 is in error and must be withdrawn.

(VIII.) CLAIMS APPENDIX

1. A power semiconductor module comprising a plurality of semiconductor components situated on substrate regions, wherein

- each substrate region has a top surface and side faces, wherein side faces of two adjacent substrate regions face each other;
- between each two adjacent substrate regions an elastic connecting element is arranged such that the connecting element directly contacts the side faces of the two adjacent substrates, wherein said connecting elements are designed to prevent a deformation of one substrate region to continue to an adjacent substrate region;
- wherein the connecting elements are formed by recesses in a plastic injection-molded module housing enclosing said substrate regions, each recess extending from an exterior of the housing and being arranged between adjacent substrate regions; and
- wherein a thickness of the power semiconductor module is reduced between adjacent substrate regions due to the recesses.

3. The power semiconductor module as claimed in claim 1, wherein

- the material recesses are slotted.

4. The power semiconductor module as claimed in claim 1, wherein

- the substrate regions are ceramic.

5. The power semiconductor module as claimed in claim 1, wherein

- the substrate regions are ceramic.

8. The power semiconductor module as claimed in claim 1, wherein

- the module housing, at least in the regions of the substrate regions, is such that it acts on the substrate regions with a spring force.

9. The power semiconductor module as claimed in claim 3, wherein

- the module housing, at least in the regions of the substrate regions, is such that it acts on the substrate regions with a spring force.

11. The power semiconductor module as claimed in claim 5, wherein

- the housing, at least in the regions of the substrate regions, is such that it acts on the substrate regions with a spring force.

13. The power semiconductor module as claimed in claim 1, wherein

- the power semiconductor module has a housing, which, in an area between the substrate regions, has action points for a mechanical pressure application of the connecting elements, and
- the housing applies pressure to the individual substrate regions.

14. A power semiconductor module comprising

- a plurality of substrate elements having top and bottom surface and side walls, each substrate element comprising a semiconductor component arranged on the top surface of a substrate element;
- one or a plurality of elastic connecting elements directly contacting opposing side walls of two adjacent substrate elements, wherein said connecting elements are

designed to prevent a deformation of one substrate element to continue to an adjacent substrate element;

- a plastic injection-molded module housing enclosing said plurality of substrate elements;
- wherein the connecting elements are formed by recesses in the module housing extending from an exterior of the housing and are arranged between adjacent substrate elements; and
- wherein a thickness of the power semiconductor module is reduced between adjacent substrate elements due to the recesses.

17. The power semiconductor module as claimed in claim 14, wherein

- the material recesses are slotted.

18. The power semiconductor module as claimed in claim 14, wherein

- the substrate is a ceramic.

19. The power semiconductor module as claimed in claim 14, wherein

- the module housing, at least in the regions of the substrate elements, is such that it acts on the substrate elements with a spring force.

20. The power semiconductor module as claimed in claim 14, further comprising

- a heat sink having a flat surface, wherein a bottom surface of the plurality of substrate elements and said plurality of connecting elements are arranged on said flat surface.

21. The power semiconductor module as claimed in claim 14, wherein

- the module housing in a region between the substrate elements comprises action points for a mechanical pressure application of the connecting elements, and
- the housing applies pressure to the individual substrate elements.

22. The power semiconductor module as claimed in claim 1, further comprising

- a heat sink having a flat surface, wherein the bottom surface of the plurality of substrate elements and said plurality of connecting elements are arranged on said flat surface.

23. A power semiconductor module comprising:

- a heat sink having a flat surface,
- a plurality of substrates arranged on the flat surface of the heat sink;
- a plurality of semiconductor components arranged on the substrates,
- one or a plurality of elastic connecting regions in direct contact with adjacent ones of the substrates and arranged directly on the flat surface of the heat sink between adjacent ones of the substrates, wherein the connecting regions are designed to prevent a deformation of one substrate to continue to an adjacent substrate and the connecting regions are formed by recesses in a plastic injection-molded module housing enclosing said substrates, each recess extending from an exterior of the housing and being arranged between adjacent substrates, wherein a thickness of the power semiconductor module is reduced between adjacent substrates due to the recesses.

24. A power semiconductor module, comprising:

a substrate segmented into a plurality of spaced apart substrate regions;

at least one semiconductor component arranged on one or more of the substrate regions;

a plastic injection-molded module housing enclosing said substrate regions and said at least one semiconductor component;

connecting regions formed by recesses in the module housing, each recess extending from an exterior of the housing and being arranged between adjacent substrate regions;

wherein the connecting region functions as an articulated hinge with each of the adjacent substrate regions so that the adjacent substrate regions can move relative to one another about the articulated hinges; and

wherein a thickness of the power semiconductor module is reduced between adjacent substrate regions due to the recesses.

(IX.) EVIDENCE APPENDIX

Exhibit A: Definition of “Recess” from Dictonary.com

Exhibit B: Definition of “Exterior” from Dictionary.com

(X.) RELATED PROCEEDINGS APPENDIX

None.

Respectfully submitted,

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